We claim:

1. A method for producing gas hydrates, comprising:

providing seed gas hydrate particles in a reaction chamber;

flowing a hydrate-forming gas into said reaction chamber;

flowing water into said reaction chamber, wherein at least one reaction occurs within said reaction chamber, wherein said at least one reaction is selected from the group consisting of (1) a first reaction wherein said seed gas hydrate particles, said hydrate-forming gas and said water react to provide gas hydrate growth onto said seed gas hydrate particles, wherein said seed gas hydrate particles having such growth are referred to herein as "growth particles," and (2) a second reaction wherein said hydrate-forming gas and said water react to form new gas hydrate particles;

removing from said reaction chamber and fragmenting at least a portion of material selected from the group consisting of said growth particles,

said new gas hydrate particles and said seed gas hydrate particles to produce fragmented gas hydrate particles; and

recycling into said reaction chamber at least a portion of said fragmented gas hydrate particles.

2. The method of claim 1, wherein the step of flowing water into said reaction chamber comprises atomizing said water.

3. The method of claim 1, wherein between the step of fragmenting at least a portion of material and recycling into said reaction chamber at least a portion of said fragmented gas hydrate particles, the method further comprises fluidizing said fragmented gas hydrate particles.

4. The method of claim 3, wherein the step of fluidizing said fragmented gas hydrate particles is carried in a second reaction chamber.

5. The method of claim 4, wherein the step of fluidizing is carried out with a hydrate forming gas.

6. The method of claim 1, further comprising recycling to said reaction chamber un-reacted hydrate forming gas.

7. The method of claim 6, wherein said un-reacted hydrate forming gas is compressed and cooled prior to the step of recycling un-reacted hydrate forming gas.

8. The method of claim 1, wherein the interior of said reaction chamber is held at a temperature between 255-320 K and a pressure ranging from 100-50,000 kPa.

9. The method of claim 8, wherein said temperature is controlled by adjusting the inlet temperature of said hydrate-forming gas and water streams with at least one refrigeration unit.

10. The method of claim 8, wherein said pressure is controlled by adjusting the inlet pressures of said gas, said water and solid inlet streams.

11. The method of claim 1, wherein said hydrate-forming gas is selected from the group consisting of methane, propane, ethane, carbon dioxide and natural gas.

12. The method of claim 1, further comprising optimizing the contact between said water, said gas and said hydrate particles.

13. The method of claim 12, wherein the step of optimizing the contact including adjusting the number, geometry, locations (above and/or in the bed), positions (angle of fluid jets) and operating conditions (fluid flow rates and pressures) of the atomizing devices.

14. The method of claim 1, wherein the step of fragmenting is carried out with a particle size reduction device selected from the group consisting of a crusher and a roll mill.

15. The method of claim 1, wherein the step of fragmenting can also be at least partially performed in-situ in said reaction chamber by fragmenting said growth particles with a particle size reduction device selected from the group consisting of a fluid jet from a water atomizing device and a feed gas nozzle.

16. The method of claim 1, wherein the step of providing seed gas hydrate particles in a reaction chamber comprises inserting seed material into said reaction chamber to assist in achieving steady state operation.

17. The method of claim 16, wherein said seed material is selected from the group consisting of seeds of ice particles and hydrate crystals.

18. The method of claim 1, wherein the step of providing seed gas hydrate particles in a reaction chamber comprises performing a start-up procedure, wherein said start-up procedure comprises:

setting the temperature of said reaction chamber at or below the freezing point of water;

producing ice in said reaction chamber by flowing atomized water having a diameter of less than 1 mm into said reaction chamber; and

flowing said hydrate-forming gas into said reaction chamber to produce said seed gas hydrate particles.